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The impact of green behavior capability on green construction performance in Indonesia

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Abstract. This paper presents an investigation of the impact of green behavior capabilities which include the external and internal factors on green construction performance. The study was conducted on construction companies, specifically those operating in Jakarta, Indonesia. A survey was developed consisting of 144 questionnaires to be distributed to the construction stakeholders. The data obtained was analysed using simple regression and stepwise approach to measure the effect of green behavior capability on the green construction performance, taking into consideration the environmental orientation optimization as a moderate variable. The most important findings of the study indicate that the green behavior capability has an impact on the green construction performance as well as impact towards the environmental orientation optimization between green behavior capability and green construction performance. This study also confirms that the practices of green behavior capability and environmental orientation optimization have significant benefits at the level of the authority policy which may contribute to significant savings at the level of the construction industries.

1. Introduction

The construction sector contributes considerable environmental impacts that encourages construction and contracting companies to implement environmentally sound practices on every project to reduce the impact and environmental problems that occur throughout the construction industries. Such practices have been regulated in many developed countries where codes of ethics, laws and regulations are enforced. Unfortunately, these practices do not happen in most developing countries, including Indonesia which only has available guidelines and incentives. And most environmental care practices in contracting companies have not been focused yet, which implies that the environment is only a complement to a project. Relatively Green Behavior is a new concept that relates to external and internal approaches both individuals and organizations. Green Behavior is usually seen as a way to evaluate the level of green commitment in general and Green Behavior Capability (GBC) is important in organizations because it reduces the environmental impact of global warming, waste, and ecosystem damage.

2. Literature Review

[1] investigated the positive effects of transformational leadership, GHRM, and employee green spirit on employee green creativity. With reference to this study, it can indicate that the external and internal conditions of employees and organizations can affect the performance of green construction in the presence of environmental orientation. [2] suggests that modern organizations are increasingly



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experiencing regulatory, normative, and social sources of pressure to be more environmentally friendly. Furthermore, green behavior improves organizational outcomes in relation to environmental sustainability. Although there are contextual differences between workplaces and homes, it is evidence that people differ in green behavior. Green behavior in the workplace is of great concern to researchers who point out the need to understand more clearly the nature of green behavior as it occurs specifically in the work environment. This requires an approach that considers the organizational context as a contributing factor, and recognizes that environmentally friendly behavior in the workplace is a form of job performance. Similar with [3] who investigated to determine the moderating role of green lifestyle to the impact of green human resource management (GHRM) on employee's job performance from various industries and a possible spillover of GHRM to employee's lifestyle. It suggests that organizations can contribute to the environment and also maintain employees' good performance. [4] suggested that stakeholders impact on company decisions and the development of their organizational resources as well as performance. The empirical results showed that green HRM practices (green recruitment, green training and involvement, and green performance management and compensation) that play a role in mediating the relationship between pressure on environmental issues from two external stakeholders (customers and stakeholders) and environmental performance.

3. Theoretical Background

[5] proposes a model of the conceptual framework of a Behavioral Green Index which are divided into Green Habitability (External Factor), Barrier Behavior (Internal Factor), and Green Behavior Evaluation. The conceptual framework refers to the green behavior model for environmental quality. This study is to examine the relationship of green behavior towards green performance in the construction industry with environmental orientation variables as mediating variables. The model developed consisted of three variables, namely green behavior, environmental orientation, and green performance. The three variables were synthesized so that they found new variables as a form of *novelty* of this study.

3.1 Green Behavior

[2] clarifies that the relationship between human behavior and environmental degradation is very high. Behavioral analysis is the basis for changing behavior to make a global difference. This is by combining the principles of behavior with organization. Green behavior can be driven by external and internal conditions such as policy, competence, and ability. This encourages green performance both individually and organizationally. In this context, green behavior is an ability of individuals and organizations to improve green performance in order to reduce the impact on the environment as well as the benefits for projects and organizations, as such it can be called green behavior capability (GBC). GBC is about individual competence, organizational ability, and performance on construction industry. GBC can be in the form of policy arrangements for both the government and organizations related to environmental issues to influence employees (employee green behavior (EGB)) so that they are in line with the environmental sustainability goals of both the organization and individual. EGB itself is encouraged to contribute to environmental sustainability including environmental impacts. However, the GBC is more focused on encouraging EGB awareness for all contractor employees on construction projects to pay attention to the environment and reduce impacts and be more effective. Based on the green behavior model on environmental quality, the factors of GBC are external (cost, economics, environmental friendly, innovation, technology adoption, function, norm, etc) and internal (value, attitude, emotional and knowledge) [5].

3.2 Environmental Orientation

[6] reported on the discovery of a positive relationship between environmental orientation and green purchasing practices with environmental cooperation. External and internal environmental orientation directed towards the practice of investment recovery and company performance. In the context of this study, environmental orientation is inherent in individuals and organizations. Both of them need to have breadth or range of understanding, practice, innovation, and all things related to reducing the environmental impact of a construction project. [7] put forward the importance of an environmental orientation both internally and externally related to aspects of innovation. [8] investigated the positive influence between environmental sustainability orientation (ESO) and financial performance results. In the context of this study, construction employees in a project need to have a environmental orientation optimization (EEO) that is reflected in their behavior, policies, and performance results. Based on the green behavior model on environmental quality, the factors of EEO are green safety, ecology, resources efficiency, energy efficiency, green health, and waste reduction [5].

3.3 Green Performance

[9] identified green performance components as "proactive environmental management" that occurred in developed countries in the 1990s so that companies anticipate the environmental impact of their operations, take actions to reduce waste and pollution as well as total quality environmental management. The social, economic, and global environmental dimensions are a measure of environmental performance as an important value in corporate activities. [10] suggested a reactive strategy in the form of a waste minimization and prevention approach in the face of legal regulations. However, most companies do not heed the legal requirements and often refuse authorization and enforcement of regulations. Based on the green behavior model on environmental quality, GCP factors in the form of three dimensions, namely: material, machinery, and labour [5].

4. Research Model and Hypotheses

4.1 Research Model

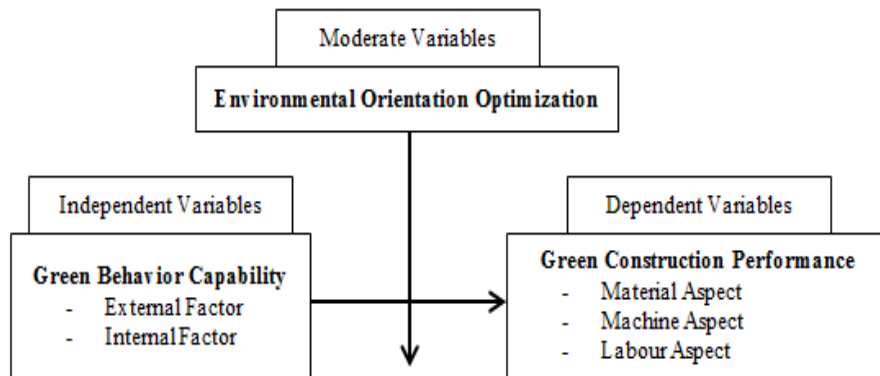


Figure 1. Research model.

The research model shown in Figure 1 is in accordance with the model developed based on the impact of green behavior on green performance [5]. This study examined both forms and it was observed that there is an impact on Green Construction Performance (GCP) as many studies show the relationship between these dimensions. GBC is positively related to the performance of GCP, but this study chooses Environmental Orientation Optimization (EEO) as a variable that encourages the improvement of GCP. It is expected that GBC have an impact on GCP through testing the proposed model of the construction industry in Indonesia.

4.2 Hypotheses

This research is based on two main hypotheses in null format as below:

- Hypotheses 1: Green Behavior Capability has no significant impact on overall dimensions of Green Construction Performance
- Hypotheses 2: whenever the Environmental Orientation Optimization is high, the impact of Green Behavior Capability on Green Construction Performance is low

5. Methodology

5.1 Population and Data Collection

The sample population of this study is represented by the construction companies under government agencies, consultant, lecture, supplier, and authority which consisted of 10 organizations operated in Jakarta, Indonesia. The unit samples consisted of higher and middle managerial employees (project manager, engineering and safety) and a total of 144 surveys were distributed.

5.2 Data Collection Method

In this study, the questionnaires were treated as the main tool, which consisted of four parts. The first part gathers the demographic information while the second part covers green behavior (external factors and internal factors) through 12 questions adopted from previous study [5]. The third part records the performance of green construction in three dimensions (material aspects, machine aspects, and worker aspects) through 18 questions adopted from previous study [11]. Finally, the fourth section which are the environmental orientation optimization through 6 questions related to green safety, ecology, resource efficiency, energy efficiency, green health, and waste reduction [5], and all questions have been developed based on the 5 Likert scale.

6. Validity and Reliability

Factor analysis was firstly used to assess the underlying relationships of a large number of items and to determine whether they can be reduced to a smaller set of factor. The validity test relies on face and content validity, where both the questionnaire and the study model has been distributed to a number of lectures in the school of engineering to be evaluated [12]. Based on their valuable notes, adjustments to the questionnaire were made. Based on Table 1, Cronbach alpha coefficient was used to test the reliability, the results show that the overall instruments Cronbach alpha coefficient is 0.755, the material performance is 0.744, the machine performance coefficient is 0.719, and labour performance coefficient is 0.742.

Table 1. Results of measure validation

Items	Factor Loadingt	Cronbach alpha
External Factor (EF)	0.413 – 0.884	0.784
Internal Factor (IF)	0.577 – 0.904	0.886
Ecology Impact (EI)	0.764 – 0.858	0.876
Resource Efficiency (RE)	0.526 – 0.849	0.787
Energy Efficiency (EE)	0.568 – 0.777	0.756
Green Healths (GH)	0.429 – 0.817	0.716
Waste Reduction (WR)	0.549 – 0.830	0.547
Material Performance (MTP)	0.681 – 0.782	0.744
Machine Performance (MCP)	0.335 – 0.758	0.719
Labour Performance (LBP)	0.526 – 0.845	0.742
All items		0.755

7. Data Analysis

The descriptive statistics and correlation matrix for all variables represented in Table 2. Simple and step wise regression analysis was used to evaluate the effect of Green Behavior on Green Performance, and Environmental Orientation Optimization as a Moderate Variable. Where stepwise analysis was used to measure the prediction of Green Behavior factors (External Factor, Internal Factor) on Green Performance Table 3 reflect the step wise results. Hierarchy regression analysis was used to measure the prediction of Environmental Orientation Optimization as a moderate variable between Green Behavior and Green Performance as presented in Table 4. The demographics are also presented in Table 5.

Table 2. Descriptive statistics and correlation matrix

Variables	EF	IF	EI	RE	EE	GH	WR	MTP	MCP	LBP
Mean	3.315	3.674	3.604	3.438	3.785	3.965	3.979	3.819	4.007	3.875
S.D	0.716	0.937	1.136	0.980	0.917	0.761	0.684	0.735	0.653	0.657
EF	1									
IF	0.172	1								
EI	0.037	0.134	1							
RE	0.711	0.968	0.769	1						
EE	0.368	0.210	0.208	0.376	1					
GH	0.198	0.151	0.145	0.180	0.240	1				
WR	0.061	0.797	0.274	0.774	0.726	0.644	1			
MTP	0.288	0.137	0.212	0.132	0.960	0.290	0.159	1		
MCP	0.137	0.257	0.686	0.739	0.345	0.212	0.235	0.192	1	
LBP	0.308	0.272	0.270	0.809	0.479	0.574	0.945	0.763	0.230	1

Note. **P<0.05.

7.1 Major Hypothesis Testing

The results indicate that there is significant impact of Green Behavior Capability on Green Construction Performance (R2= 0.72, p < 0.05). Table 3 show that Green Behavior Capability and environmental orientation optimization have more impact on Green Construction Performance (the Beta value for the predicted variables respectively are $\beta=0.222$, $\beta=0.169$, p < 0.05). Hence, the null hypothesis is rejected. The results concluded that the direct impact of overall dimensions of Green Behavior Capability on Green Construction performance were ($\beta=0.222$), while the impact of environmental orientation optimization as a moderate variable were ($\beta=0.169$) and (R2 change = .59) which it means 81.94% from the change of the green construction performance depend on environmental orientation optimization, and then the null hypothesis rejected and accept the alternative hypothesis.

Table 3. Regression results: green behavior capability on green construction performance

Variables	Beta	t	Sig.*
EF	0.421	5.526	0.000
IF	0.625	9.550	0.000

Table 4. Hierarchy regression results: environment orientation optimization as moderate variable between green behavior capability and green construction performance

Variables	Beta	t	Sig.*
Green Behavior Capability	0.111	1.029	0.000
Interaction between Green Behavior Capability and environmental orientation optimization	0.240	2.941	0.004

Table 5. Respondents demographic characteristics

Variables	Percent
Age	
30 Years and below	16.7
31-40	13.9
41-50	30.6
51-60	16.0
61 Years and more	22.9
Gender	
Male	87.5
Female	12.5
Education	
High School	0
After H. School	0
Diploma	2.8
Bachelor	93.1
PhD	4.2
Job Title	
Project Department	28.5
Safety and Health	56.9
Engineering	5.6
Consultant	3.5
Authority	5.6
No. Respondents	144

8. Conclusion and Implication

8.1 Conclusion

The study aims are to measure the impact of green behavior capability in the Indonesia Construction Industry to enhance green construction performance. And also to measure the environmental orientation optimization for companies as a moderator variable on the relationship between the green

behavior capability and green construction performance. Based on the findings of statistical analysis external factor and internal factor positively impact the green construction performance. The hypotheses testing showed that external factor has a greater impact on organizational performance compared to internal factor. As for the moderate variable environmental orientation optimization, it is clear that the environmental orientation optimization significantly affects the relationship between green behavior capability and green construction performance.

8.2 Implication

This study confirms the presence of impact of green behavior capability in green construction performance. This also confirms the practices of green behavior and green performance have significant benefits to the industry and the authority by achieving significant savings. Green behavior capability and green construction performance require deepen principle of practices and rules in construction sector, as the authority is the main driver in this application through the making of practices and rules of green behavior policies. The findings of the study can be added to the field of encourage construction sector in Indonesia to adopt the green behavior practices where the government of Indonesia encouraging to adopt the green behavior by offering incentives to green behavior policy. This study recommends that future researches should examine other contractors and projects in Indonesia, rather than in Jakarta alone. In addition, similar study should be extended to other developing countries to allow the possibility of sharing and comparing the results.

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